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PUBLIC HEALTH REPORTS.

Professor Koch's Views on the Prevention of Plague.

By Professor Kitasato.

[Translated from the Tokyo Jiji Shimpo, July 22 and 23, 1908, by Passed Asst. Surg. Dunlop Moore]

Not only has plague in Japan occasioned great expenditure of public money and labor, but the indirect losses through interruption of commercial intercourse and interference with business undertakings can not be easily estimated.

Since the discovery of the cause of the disease increasingly exact investigations into the avenues of infection have rendered us familiar with the extremely important rôle that anti-rat measures play in its prophylaxis. Such measures were enforced at an early date in this country, and the number of rats destroyed has reached an annual total of from several hundred thousand to a million. Nevertheless at the present day no appreciable diminution in the number of rodents can be noticed. Reproduction keeps pace with destruction, so that we are at a loss to know how to proceed. When we consider that on the one hand plague has already obtained a firm foothold in two or three localities in Japan and on the other hand that new infective material is being constantly introduced from abroad, it would appear that the absolute suppression of the disease is an almost impracticable task.

However correct may be the underlying theories upon which we base our procedures, antipest measures, being of a negative character and necessarily involving great expenditure of time and money extending over a long period, are apt eventually to incur the disfavor of the public at large. Consequently they are not properly carried out. Therefore the urgent need of the present time is a plan for the destruction of rats, simple of application and requiring a minimum expenditure of time and labor—a demand, however, that we are not yet in a position to meet.

Taking advantage of the recent visit of the eminent bacteriologist Robert Koch to this country, I laid before him in detail the present status of the plague epidemic and requested his advice in the premises. As his views, which I had the good fortune to obtain, touch upon some points of vital importance in the prophylaxis and eradication of plague, I give a résumé, as follows:

> The rat is the chief agent in the diffusion of plague, and our preventive measures must be based on this principle. The encouragement of the destruction of rats, as early practiced in Japan, is an eminently proper procedure, but in the extermination of animals of such great reproductive power the use of artificial methods, like mechanical devices and poisonous drugs, must prove laborious, expensive, and at the same time comparatively inefficient. On the other hand, in the natural world the mutual relations of living things is extremely intricate and subtile, and by paying attention to this point we may discover natural methods of dealing with this problem, the limited powers of man being far inferior to the boundless resources of nature.

Permit me to cite two or three instances of the very successful utilization of the natural correlation between living beings which may by analogy serve to illustrate the proper means to be employed in the work of demurization. Some years ago an amateur botanist admiring its pretty flowers introduced a verbenaceous plant called *lantana* from America into the Hawaiian Islands. Through the agency of birds its seeds were distributed broadcast. It soon became disseminated throughout the entire group of islands as a harmful weed to the great detriment of agriculture. In its native land, Mexico, this plant does not flourish to the same disastrous extent. At the end of a careful investigation it was discovered that there exists in Mexico a species of small fly, called *agromyza*, which deposits its eggs within the seed of the *lantana* and thus checks increase of the plant. This fly was introduced into Hawaii and propagated, with the result that in a few years the omnipresent *lantana* pest showed signs of diminution.

Another remarkable example is found in the *Perkinsiella saccharicida*, a species of leaf hopper injurious to the sugar cane in the Hawaiian Islands. This insect is parasitic on the stalk and leaves of the sugar cane, extracting the juice, and is a source of such great damage that in the period of four years between 1901 and 1904 the amount of loss occasioned by it reached the enormous sum of several million dollars. On this account the sugar planters' association established an experiment station and dispatched specialists to distant parts of the world for the purpose of investigating methods for the destruction of injurious insects and of searching for an enemy of this insect. Thus there was discovered in Australia a species of ant-like animal named *aphanomerus pusillus* parasitic within the egg mass of the leaf hopper. This beneficial insect was introduced into Hawaii in the year 1904 and propagated with the result that the great insect pest of the sugar cane *Perkinsiella* has shown a remarkable diminution and no longer causes the damage of former years. These two instances prove how beneficial to human activity is the study of the mutual interdependence between living beings in the realm of nature.

Again in Japan we find that, as a consequence of increasing interest in fruit culture, foreign apple trees have been imported from America and assiduously cultivated. Nevertheless through the ravages of the woolly *aphis* which was introduced at the same time, I learn that at present throughout the Tohoku district scarcely a single healthy fruit tree can be found. This condition of affairs is clearly due to an imperfect knowledge of the interrelation existing in the natural world.

Successful demurization must be based on this principle, namely, the seeking out and the utilization of the natural enemies of the rat. From an early date I have been carrying on researches regarding the enemies of rats and have used in my experiments a number of voracious animals, among them the ichneumon of Egypt, the mongoose of India as well as the common European ferret. As well as devouring rats these animals attack domestic poultry, so that their beneficial effects are offset by the loss they occasion, and their practical value is nil. On the other hand, from ancient times, cats have been the most common and best known to man of the enemies of the rat. When properly trained they do us no harm, and are in all respects most fitted for the task before us. Though these facts are familiar to everyone they have not yet been practically utilized in the prophylaxis of plague. Random researches in distant lands will not necessarily lead to the successful accomplishment of our object. The most useful things are rather to be found among the commonplace and the readily accessible, as in this instance.

However, in employing cats for this purpose we should determine a certain system and follow it out in an orderly manner, in the main, as follows:

1. Pass laws requiring each house to keep a certain number of cats and cause the police to make frequent inspections.
2. By establishing a system of prizes seek for cats of approved ability as ratters.
3. Carry on a world-wide search for strains of cats especially skilled as ratters and encourage their introduction and propagation.
4. We should stimulate interest in the breeding of improved strains of cats by promoting cat shows, etc., just as in the case of horses and cattle.
5. Vessels plying between plague-infected ports should be obliged to carry a fixed number of cats, the number depending upon the tonnage of the vessels.
6. Building regulations should require that attics and other places frequented by rats be provided with openings large enough to admit cats.
7. In the case of plague-infected districts or areas threatened with invasion by plague, special companies of cats should be organized and at fixed intervals they should be isolated and the presence or absence of plague among them should be determined.

The above is merely a sketch in rough detail of a scheme for employing cats in antipest work. The method is extremely easy of execution and by no means involves great expense. Further, as its efficacy is not merely of temporary duration, we should eventually accomplish our object of exterminating the rat. Moreover, during the time of a plague epidemic, the trouble involved in rat examinations should be lessened. If from time to time we isolate and keep under observation the cats that have been feeding upon rats, not only do we obviate any fear of spreading the infection but at the same time we have a means of determining the exact extent of the spread of the disease.

Since a multitude of artificial devices of human contrivance are not equal in efficiency to one of nature's methods in destroying rats during antipest campaigns, the most efficacious means of accomplishing our object is the utilization of the cat.

Beginning with such places as Osaka and Kobe, where plague infection constantly lies dormant, the encouragement of the breeding of cats with a view to demurization is the urgent duty of the present hour.

UNITED STATES.

[Reports to the Surgeon-General, Public Health and Marine-Hospital Service.]

PLAGUE IN GROUND SQUIRRELS.

In a communication dated August 28, 1908, Passed Assistant Surgeon Blue, San Francisco, Cal., transmits a full bacteriological report by Passed Assistant Surgeon McCoy on the plague-infected ground squirrel found on the Farias ranch in the northern part of Contra Costa County, August 5, 1908. A case of human plague occurred on this ranch July 11, 1908. [See Public Health Reports, July 31, 1908, page 1096.]

Doctor Blue observes that this is perhaps the first demonstration of the occurrence in nature of bubonic plague in the ground squirrel (*Citellus beecheyi*) of California. There can be no further doubt, therefore, he writes, that these rodents are an important factor in the dissemination of infection.

Practically the same findings have been obtained by Acting Assistant Surgeon Wherry in the Oakland laboratory, and are reported under date of August 24, 1908.

The following is the report, dated August 27, 1908, of Passed Assistant Surgeon McCoy on the examination of the tissue from the squirrel suspected of being infected with plague:

EXAMINATION OF TISSUE.

The tissue presented for investigation was a piece of the lung of the squirrel. It was received on August 6, 1908. Smear preparations from this tissue, made as soon as received and stained with 1 per cent carbol-thionin, showed the presence of an organism that was morphologically as follows:

Short rods varying in length from 1 to 2 micra and in width from one-half to three-fourths of a micron, and staining most intensely at the ends. Circular bodies about three-fourths of a micron in diameter and staining rather faintly except at the rim. Forms intermediate between the two described. None of the organisms retained the stain when treated by Gram's method.

CULTURES.

Stroke cultures were made directly on agar. A pure culture of an organism that grew in the form of small, round, moist, shining colonies, which when touched with the needle were found to be viscid,